

## Pesticides and Parkinson's Disease

### The Legacy of Contaminated Well Water

Epidemiologic studies since the early 1990s have suggested that exposure to various classes of pesticides increases the risk of developing Parkinson's disease (PD). Animal studies have backed up that link, revealing how pesticides may target the dopaminergic system, which is damaged in PD. New data from the Parkinson's Environment and Genes Study show that residents of California's Central Valley who over many years drank well water that was probably highly contaminated with certain pesticides were more likely to have PD or PD symptoms than residents who didn't drink contaminated well water [EHP 117:1912–1918; Gatto et al.].

Private wells are at risk of pesticide contamination because pesticides can drift several hundred meters from application sites and travel through the soil. Moreover, many of the private wells studied were less than 15–20 yd deep, lessening the likelihood that pesticides will have degraded by the time they reach the water supply. Unlike municipal water supplies, private well water is not required to be monitored for contamination.

The researchers analyzed long-term data on pesticide application rates near the homes of the study participants, who included 368 people clinically confirmed to have possible or probable PD and 341 controls. The authors had access to 26 years' worth of data collected under California's mandated pesticide use reports program on the commercial application of pesticides, including where the pesticides were applied, on what date, and in what quantities. They studied

26 pesticides that were potential groundwater contaminants or that had been previously linked to PD.

The researchers combined those data with land-use maps, which the California Department of Water Resources updates every 7–10 years, to pinpoint more precisely where pesticides had been applied. Using geographic information system software, they were able to merge historical data on home addresses, land use, and pesticide applications. The result was a prediction of amounts of pesticides applied per acre per year within 500 m of the study participants' homes.

People with PD were more likely to get their water from private wells and to have drunk well water longer than controls. Whereas people with exposure to ambient pesticides—essentially, proximity to sites where pesticides were applied—were 15–57% more likely to be classified as having PD than people without ambient exposure, those with combined ambient exposure and exposure via well water potentially contaminated with methomyl, chlorpyrifos, or propargite were 67%, 87%, or 92% more likely to be cases. The odds of PD also increased as the number of different pesticides that potentially contaminated a subject's drinking water increased.

Unlike previous research on the link between PD and pesticide exposures, this study used a semiquantitative approach to estimating pesticide exposure and did not rely on study subjects' recall. Also, all PD cases were clinically confirmed by a movement disorder specialist. The results therefore considerably strengthen the evidence that exposure to pesticides in well water may contribute to PD.

**Tina Adler** first wrote for EHP about the Clinton–Gore environmental agenda in 1993. She is a member of the National Association of Science Writers and the American Society of Journalists and Authors.

## Chronicle of a Health Crisis

### Global Implications of the 2008 Melamine Event

Melamine is commonly used to manufacture strong and durable laminates, plastics, adhesives, and flame-resistant textiles. It also has been deliberately added to food and animal feed, sometimes in high amounts, to boost the appearance of protein content based on nitrogen analysis. The result can be serious health threats, including renal failure and death. In 2007–2008, for instance, the deliberate addition of melamine to raw milk used in powdered infant formula and other milk and dairy products caused an outbreak of kidney stones and renal failure in Chinese infants and raised significant implications for global food and feed safety [EHP 117:1803–1809; Gossner et al.].

Because melamine is used in such a wide range of products, its trace presence in many foods is inevitable—action is not usually taken if levels are below 1.0 mg/kg for infant foods or 2.5 mg/kg for other food products. In comparison, contaminated powdered infant formula produced by the Sanlu Group and distributed in China contained up to 2,563 mg/kg.

Using information originally reported by the Chinese Ministry of Health to the World Health Organization and shared through the International Food Safety Authorities Network (INFOSAN), the authors describe the unfolding of events from the first reported cases of sick babies in China to the export of contaminated dairy and non-dairy products (including ammonium bicarbonate, fresh and dried eggs, nondairy creamer, and animal feed) that eventually reached 47 known countries. Although parents who used Sanlu formula first began filing complaints in December 2007, the global community did not become aware of the crisis until September 2008.

Countries responded in a variety of ways ranging from taking no action at all to banning all imports of milk and dairy products from China. Meanwhile, China reported a total of 6 child deaths and 294,000 cases of children affected by consumption of contaminated formula and milk products. Health effects ranged from discolored

urine to kidney stones to acute renal failure and subsequent death. Because milder cases were often asymptomatic, many more children may have been affected both in China and abroad.

Given the potential global impact of the 2008 event, the authors state that well-structured national food safety systems—combined with coordination among food safety authorities and rapid communication through INFOSAN—are key components in controlling such outbreaks. There also should be one harmonized set of international standards for acceptable levels of potential contaminants in food and feed products as well as universal methods of detection, prevention, and containment.

**Tanya Tillett**, MA, of Durham, North Carolina, is a staff writer/editor for EHP. She has been on the EHP staff since 2000 and has represented the journal at national and international conferences.



Chinese parents wait to have their babies examined for melamine effects at a Suzhou hospital, 22 September 2008.